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AUDI AG

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Motor vehicle front section has extendable longitudinal side beams with impact absorbing deformable sections

**NOVELTY:** The motor vehicle has a front section (1) with two opposing longitudinal beams (2) on the sides of the vehicle, each with a deformable section (4) for impact force absorption. The deformable sections are movable between extended and retracted positions dependent on the sensed speed of the vehicle. The deformable sections are moved by actuators to selectively extend the side longitudinal beams.

**USE:** For motor vehicle impact absorbing bodywork:

**ADVANTAGE:** Allows increased energy absorption on frontal impact.

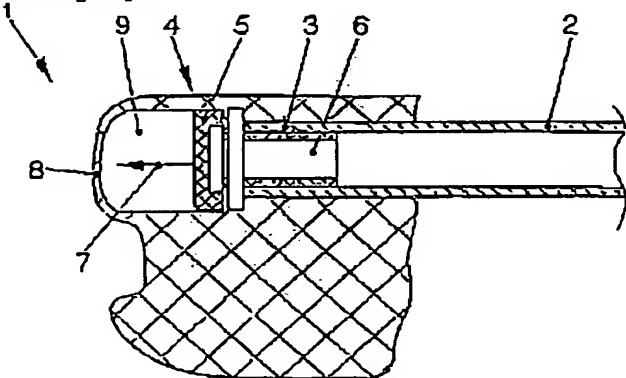
**DESCRIPTION OF DRAWINGS:** Drawing shows front section of motor vehicle. Vehicle front section 1 Longitudinal beams 2 Deformable sections 4

Company Code: NSUM

Drawing: Dwg. 1/2

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**Motor vehicle front section has extendable longitudinal side beams with impact absorbing deformable sections**

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## Publication

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## Requested

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**Abstract**

The motor vehicle has a front section (1) with two opposing longitudinal beams (2) on the sides of the vehicle, each with a deformable section (4) for impact force absorption. The deformable sections are movable between extended and retracted positions dependent on the sensed speed of the vehicle. The deformable sections are moved by actuators to selectively extend the side longitudinal beams.

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State of the art

[ 0001 ] The invention concerns a front car for a vehicle, in particular for a motor vehicle, after the generic term of the requirement 1.

[ 0002 ] In a motor vehicle are a multiplicity of construction units for an absorption of kinetic energy in the case of an impact appropriate. In principle in addition during a force application kinetic energy in work of deformation converted, whereby distorts such construction units, especially will be shortened. Such construction units are in particular in the vehicle structure and in the vehicle internal area arranged.

[ 0003 ] It is for example generally well-known to design front side members as fold becoming baggy pipe which are shortened in the case of a front impact of the motor vehicle and unfolded for energieabsorption. Generally are also deformation elements admit as components of the inside paneling of a passenger space within a possible impact range of a passenger in the case of a vehicle impact.

[ 0004 ] Generally are deformation elements admit as so-called type damage elements. These represent in particular a connection between side member ends and a bumper cross beam of a motor vehicle. In the case of an impact of predetermined order of magnitude they deform and are to prevent a damage of the more rigid side members. Thus if necessary repairs can be made simply, fast and economically by exchange of the type damage elements. Such type damage elements are in particular well-known as inverting pipes, percussion poles or fold becoming baggy pipes in a majority of execution forms.

Setting of tasks

[ 0005 ] Task of the invention is it, an alternative front car for a vehicle, in particular for a motor vehicle to create which in particular exhibits good energy absorptive properties in the case of a front impact.

[ 0006 ] This task solved with the characteristics of the requirement 1.

[ 0007 ] In accordance with requirement 1 a front car two exhibits itself on opposite sides of the front car into for instance side members extending in vehicle longitudinal direction, whereby at the side member ends a deformation element is arranged for the absorption by kinetic energy in the case of an impact on the front cars in each case. The deformation element is according to invention shiftable by means of an actuation equipment as a function of by means of at least one sensor facility sensierten accident parameters, in particular the driving speed, between a bringing in position and at least one driving out position for an extension of the side member assigned in each case.

[ 0008 ] With such structure front car can by deformation element energy absorptive properties such vehicle, in particular with frontal impact substantially improved, since thereby over a longer deformation way, for which the deformation elements are shifted into the driving out position, more energy in work of deformation can be converted. The actuation equipment can be operated here for shifting the deformation elements between the bringing in position and the driving out position as a function of a sensierten driving speed and/or as a function of by means of e.g. a pre crash sensor technology sensierten data. I.e. that the deformation elements can be depending upon sensierten accident parameters the deformation elements either in the bringing in position or in the driving out position. With deformation elements in the bringing in position the possibility is not given the energieabsorption due to the missing extension of the side members by the deformation elements, however a accordingly softer impact of the same is possible on the front cars e.g. in the case of an impact of a pedestrian on the front cars, so that thereby evtl. Impairments of the pedestrian to be reduced can.

[ 0009 ] In a particularly preferred execution form the deformation element knows sensor facility with one by means of that at least sensierten driving speed, which lies within a type damage speed range, when type damage element into the driving out position are shifted.

[ 0010 ] If the deformation elements are in the driving out position, then thereby the side member assigned in each case is extended by the deformation element, so that thereby a longer deformation way is available by than type damage element the used deformation element and thus if necessary a damage of the side members can be prevented. Thus repairs can be made simply and economically by exchange of the deformation elements.

[ 0011 ] If one becomes by means of that at least sensor facility sensierte driving speed, which lies within a pedestrian protection speed range, which follows the type damage speed range, whereby the speed upper limit of the type damage speed range is smaller than the speed lower bound of the pedestrian protection speed range, determined, the deformation element can be shifted into the bringing in position.

[ 0012 ] Thus an impact softer for the pedestrian is possible in the case of an impact of a pedestrian on the front cars, in particular on the bumper coat by the deformation elements in the bringing in position, so that thereby the injury risk for the pedestrian can be reduced.

[ 0013 ] Lies the driving speed sensierte by means of that at least if sensor facility within a Frontcrash speed range, which follows the pedestrian protection speed range, whereby the speed upper limit of the pedestrian protection speed range is smaller, as the speed lower bound of the Frontcrash speed range, the deformation element can be shifted into the driving out position. Thus is extended with a Frontcrash by the deformation elements the side members assigned in the driving out position in each case, so that thereby a longer deformation way is available for the conversion of energy to work of deformation. Thus the introduced kinetic energy can be if necessary so far diminished by the deformation elements as well as the side members that the load for the passenger space is reduced for the passengers and thus

[ 0014 ] In the case of a misalignment of the deformation elements alone in dependence of the vehicle speed this can take place reversibly, with an additionally sensierten Frontcrash and thus a crashaktiven misalignment of the deformation elements can this also irreversible take place.

[ 0015 ] During a concrete further training the speed upper limit of the type damage speed range in approximately 15 km/h can amount to. The speed upper limit of the pedestrian protection speed range can amount to in approximately 40 to 45

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km/h. Thus assigned different positions of the deformation elements different legal requirement can be fulfilled more simply and/or better due to that the respective speed range.

[ 0016 ] The requirements during a type damage examination are laid out going by that up to a maximum speed by 15 km/h in the case of an impact on the front cars a damage of the side members is to be avoided. Since the deformation elements are in the type damage speed range in the driving out position, thereby the conversion of the introduced kinetic energy is possible by the misalignment and/or deformation of the deformation elements, so that thereby the side members can remain intact.

[ 0017 ] With one sucked. Beinimpaktortest, with which demanded pedestrian preventive measures can be examined, may do maximum load limits in the case of an impact of a pedestrian on the front cars, e.g. a pre-determined knee bending angle, are not exceeded. The associated speed range is upward limited with a maximum speed from 40 to 45 km/h. The deformation elements are in the pedestrian protection speed range in the bringing in position, so that in the case of an impact of a pedestrian on the front cars the misalignment and/or deformation of the deformation elements cannot take place. Thus the load for the pedestrian is favourably reduced.

[ 0018 ] With higher driving speeds, which lie over the speed upper limit of the pedestrian protection speed range, the protection is the center of attention and/or if necessary the soundness of the passenger space and thus the passengers with a Frontcrash. This is demanded e.g. in the euro NCAP. Thus are in the Frontcrash speed range of the deformation elements in the driving out position, so that thereby the side members are extended and an increased deformation way and/or misalignment way is available altogether. The introduced kinetic energy is converted by the deformation element as well as the side members by deformation of these two construction units so far in work of deformation that the load of the passenger space can be reduced favourably.

[ 0019 ] In accordance with a further arrangement the deformation element can exhibit an impact plate and directly a guidance part following to it. The guidance part is adjustably held in the side member end assigned in each case. Thus an operator-safe misalignment of the deformation element of the bringing in position is possible into the driving out position. The guidance part can be positively taken up in the side member end thereby, so that thereby possible tilting is impossible during the misalignment of the deformation element

[ 0020 ] In a preferential further training this can be preferably shifted by the actuation equipment strength-limited little width unit partly toward bringing in position for the absorption of kinetic energy during an application of force on the deformation element in the driving out position. The force delimitation can besides via a corresponding execution of the deformation element and/or the assigned side member take place. In principle at least partial bumping of the deformation elements out is possible for the conversion of the kinetic energy in place of and/or to the misalignment of the deformation elements.

[ 0021 ] In accordance with a further training the actuation equipment can be hydraulically and/or mechanically and/or solenoid operable. Such actuation equipments are general well-known and can be selected thus e.g. in dependence of the building area the available freely.

[ 0022 ] In a preferential execution form an outer skin forming bumper coat can be trained a deformation free space between the deformation element in the bringing in position and. In the case of a misalignment of the deformation element into the driving out position the deformation free space is filled out to a large extent with the deformation element. Thus the misalignment way maximum for the deformation element the available is used.

[ 0023 ] In the case of an impact e.g. a pedestrian on the front cars with a driving speed within the pedestrian protection speed range, with which the deformation element is in the bringing in position, the bumper coat under utilization of the deformation free space can be indentable for the absorption of kinetic energy. Thus the pedestrian meets the bumper coat soft in relation to the deformation element, which indents thereby into the deformation free space. Thus the load for the pedestrian can be reduced due to the impact to the bumper coat and associated indenting of the same, so that injury weight can be lowered with the pedestrian.

#### Auführungsbeispiel

[ 0024 ] On the basis a design the ending is more near described.

[ 0025 ] Show:

[ 0026 ] Fig. 1 a schematic sectional view in vehicle longitudinal direction by a side member with a deformation element in a bringing in position, and

[ 0027 ] Fig. 2 the schematic sectional view of Fig. 1 with the deformation element in the driving out position.

[ 0028 ] A front car 1 for a motor vehicle exhibits itself two on opposite sides of the front car 1 into for instance side member 2 extending in vehicle longitudinal direction. At the side member ends of 3 a deformation element is arranged for the absorption of kinetic energy in the case of an impact on the front car 1 in each case.

[ 0029 ] For the elucidation of the arrangement of the deformation element 4 at the side member end 3 schematically a sectional view is in vehicle longitudinal direction represented by the side member 2 in Fig. 1. The deformation element covers impact plate 5 and a guidance part of 6 following directly to it. The guidance part of 6 can be shifted within the side member end of 3, whereby in Fig. 1 a bringing in position of the deformation element 4 is shown. In the case of a misalignment of the deformation element 4 in direction of arrow of the arrow 7 of Fig. 1 the deformation element 4 is shifted by the bringing in position into the driving out position represented in Fig. 2. Thus the side member 2 in driving direction is extended seen forward.

[ 0030 ] A bumper coat 8 forms the outer skin of the front car within the range of the side members 2, whereby the bumper coat 8 is so trained in the range of the deformation element 4 that with a deformation element 4 in the bringing in position a deformation free space 9 between the bumper coat 8 is formed and the impact plate 5 of the deformation

element 4. The misalignment of the deformation element 4 between the bringing in position and the driving out position takes place by means of a not represented actuation equipment.

[ 0031 ] Due to a not represented sensor facility sensierten accident parameters, among which also in particular the driving speed is to be ranked, the deformation element can be shifted reversibly and/or irreversibly between the bringing in position and the driving out position. If the driving speed is within a type damage speed range, which is upward limited preferably by a maximum speed by 15 km/h, the deformation element 4 can be in the driving out position represented in Fig. 2, so that the deformation element functions as type damage element. During a collision within this speed range the reformation element is shifted and/or deformed strength-limited toward bringing in position, so that the side members 2 remain if necessary damage-free. With higher driving speeds, which within the pedestrian protection speed range, which lies is upward limited preferably by a maximum speed from 40 to 45 km/h, the reformation element can be 4 in the bringing in position, so that the deformation free space 9, which is formed between the impact plate 5 of the reformation element 4 and the bumper coat 8, is available. Thus in the case of an impact of a pedestrian on the bumper coat of 8 these indented under utilization of the deformation free space, whereby the load for the pedestrian is favourably reduced. With high driving speeds, which lie within a Frontcrash speed range, whose speed lower bound is larger than preferably 45 km/h, the reformation element can be 4 in the driving out position, so that thereby the side member 2 is extended for a longer deformation and/or misalignment way and an associated larger energieabsorption of the introduced kinetic energy. Thus the protection of the passenger space, which is priority during collisions in this speed range, is increased.

#### Reference symbol list

- 1 front car
- 2 side members
- 3 side member end
- 4 deformation element
- 5 impact plate
- 6 guidance part
- 7 arrow
- 8 bumper coat
- 9 deformation free space

1. Front car for a vehicle, in particular for a motor vehicle marked by two itself on opposite sides of the front car in for instance side members, whereby at the side members a deformation element is arranged for the absorption by kinetic energy in the case of an impact on the front cars in each case, extending in vehicle longitudinal direction, by the fact that the deformation element is shiftable (4) by means of an actuation equipment as a function of by means of at least one sensor facility sensierten accident parameters, in particular the driving speed, between bringing in position and at least one driving out position for an extension of the side member (2) assigned in each case

2. Front car according to requirement 1, by it characterized,

that the deformation element (4) with one by means of that at least sensor facility sensierten driving speed, which lies within a type damage speed range, when type damage element is shiftable into the driving out position,

that the deformation element (4) with one by means of that at least sensor facility sensierten driving speed, which within a pedestrian protection speed range, which lies follows the type damage speed range, whereby the speed upper limit of the type damage speed range is smaller than the speed lower bound of the pedestrian protection speed range, into the bringing in position is shiftable, and

that the deformation element (4) with one by means of that at least sensor facility sensierten driving speed, which within a Frontcrash speed range, which lies follows the pedestrian protection speed range, whereby the speed upper limit pedestrian protection speed range is smaller than the speed lower bound of the Frontcrash speed range, into the driving out position is shiftable

3. Front car according to requirement 2, by it characterized,

that the speed upper limit of the type damage speed range is in for instance about 15 km/h, and

that the speed upper limit of the pedestrian protection speed range is in for instance about 40 to 45 km/h.

4. Front car after one of the requirements 1 to 3, by the fact characterized that the deformation element (4) exhibits an impact plate (5) and directly a guidance part of (6) following to it such that the guidance part of (6) is adjustably held in the side member end of (3) assigned in each case

5. Front car after one of the requirements 1 to 4, by the fact characterized that during an application of force on the deformation element (4) in the driving out position this preferably is by the actuation equipment strength-limited at least partly toward bringing in position shiftable for the absorption of kinetic energy.

6. Front car after one of the requirements 1 to 5, by the fact characterized that the actuation equipment is hydraulically and/or mechanically and/or solenoid operatable

7. Front car after one of the requirements 1 to 6, by the fact characterized that between the deformation element (4) in the bringing in position and an outer skin forming bumper coat (8) a deformation free space (9) is trained such that during an extension of the deformation element (4) into the driving out position the deformation free space (9) is filled out with the deformation element (4) to a large extent

8. Front car according to requirement 7, by the fact characterized that in the case of an impact on the bumper coat (8) in the pedestrian protection speed range this is indentable under utilization of the deformation free space (9) for the